•	Hris was	STUDENT ID NO											
MULTIMEDIA		UNIVERSITY	•					. ==-					

## **MULTIMEDIA UNIVERSITY**

## FINAL EXAMINATION

TRIMESTER 2, 2018/2019

# DCS5158 – COMPUTER ARCHITECTURE

9 MARCH 2019 9:00 a.m. – 11:00 a.m. ( 2 Hours )

#### INSTRUCTIONS TO STUDENT:

- 1. This question paper consists of FIVE pages.
- 2. **SECTION A:** Answer **ALL** questions. Please shade your answers on the OMR sheet provided.
- 3. **SECTION B**: Answer **ALL** questions. Please write your answers in the answer booklet provided.

### SECTION A: MULTIPLE CHOICE QUESTIONS (MCQ) (10 Marks)

Instruction: Answer ALL questions in this section. Shade your answers on the OMR sheet provided.

	hich component of the CPU is responsible for directing the flow of instructions and ta?
A B	Arithmetic and logic unit Registers
	CPU interconnections
me A B C	hich generation of computers used vacuum tubes for digital logic elements and emory?  First  Second  Third  Later
A B C	hich of the following describes the accumulator (AC)?  Contains the 8-bit opcode instruction being executed.  Contains the address of the next instruction pair to be fetched from memory.  Holds temporarily operands and results of ALU operations.  Specifies the address in memory of the word to be written from or read into the memory buffer register (MBR).
A E C	perands for arithmetic and logic operations are presented to the ALU in  input devices  registers  output devices  the processor
A E C	hat is -18 <sub>10</sub> in sign-magnitude notation?  1. 10010010 <sub>2</sub> 2. 10010011 <sub>2</sub> 2. 00010010 <sub>2</sub> 3. 00010001 <sub>2</sub>
is A E	ne of the elements in machine instruction that specifies the operation to be performed referred to as  2. result operand reference 2. source operand reference 2. operation code 3. next instruction reference
	Continued
TSM/EF	IE 1/5

- 7. Which of the following is the instruction field that corresponds to basic elements of the instruction?
  - A. Opcode, Program Counter
  - B. Opcode, Register
  - C. Opcode, Operand Reference
  - D. Only opcode
- 8. "Every computer will have a set of instructions. One of the instructions is involved with movement of data into or out of register or memory locations." Referring to the given statement, which instruction type is involved?
  - A. Data processing
  - B. Data storage
  - C. Control
  - D. Data movement.
- 9. The method of accessing units of data in which a word is retrieved based on a portion of its contents rather than its address is referred to as method.
  - A. associative
  - B. random access
  - C. sequential
  - D. direct
- 10. Which of the following is a form of read-only memory?
  - A. Optical

TSM/EHE

- B. Magnetic surface
- C. Magneto-optical
- D. Semiconductor

2/5

#### **SECTION B: STRUCTURED QUESTIONS (40 Marks)**

Instruction: Answer ALL questions in this section. Write your answers in the answer booklet provided.

#### QUESTION 1 (10 Marks)

- a) Given that the PC contains 211, the address of the first instruction, and the partial list of opcodes as shown in Figure 1:
  - i. Illustrate the execution of the subsequent **FIVE** instructions from memory content in the diagram (211, 212, 213, 214 and 215).
  - ii. Show the contents of the registers (Program Counter PC, Accumulator AC, and Instruction Register IR).

[5 Marks]

Memory	content
211	1373
212	6375
213	5372
214	6374
215	2375
	***
372	5151
373	16DA
374	0B2C
375	0123
	***

: Far Par	tial list of opcodes a same :
0001	Load AC from memory
0010	Store AC to memory
0101	Add to AC from memory
0110	Subtract memory from AC

Figure 1. Memory content and partial list of opcodes

b) Convert 282.375<sub>10</sub> into binary. Show the steps to get the answer.

[1 Mark]

c) Convert 635.3478 into hexadecimal. Show the steps to get the answer.

[1.5 Marks]

d) Using 8-bit two's complement, calculate  $56_{10} - 108_{10}$ . Show the steps and verify the result. [2.5 Marks]

Continued...

#### QUESTION 2 (14 Marks)

a) Given the following expression,

$$Z = (B * C / D) * (F + A * E)$$

i.	Convert the expression to postfix notation.	[l Mark]
ii.	Write the following machine instructions:	
	Zero-address	[1 Mark]
	One-address	[2 Marks]
	Two-address	[1 Mark]
iii.	Draw the stack diagram that illustrates the program execution.	[1.5 Mark]

b) A computer system has a memory architecture made up of main memory of 45TB and cache of 400KB. In order to perform an efficient mapping function, the main memory is arranged in blocks of 128 bytes.

Draw the address structures for different mapping functions as stated below. Indicate the fields and the number of bits required for each field.

i.	Direct Mapping	[1.5 Marks]
ii.	Eleventh-Way Set Associative Mapping	[1.5 Marks]
iii.	Associative Mapping	[0.5 Mark]

#### QUESTION 3 (10 Marks)

- a) Describe **THREE** differences between sequential access and random access of computer memory. [3 Marks]
- b) What is a system bus? Explain TWO characteristics of each of the following types of system buses.
  - i. Data bus
  - ii. Address bus
  - iii. Control bus

[7 Marks]

#### QUESTION 4 (10 Marks)

- a) List **THREE** (3) categories of external devices and give at least **TWO** (2) examples of each. [3 Marks]
- b) Given FIVE (5) instructions where each instruction has FIVE (5) stages (FI, DI, CO, EI and WO) with delays of 5, 3, 2, 7 and 3 seconds for each stage respectively.
  - i. Draw a timing diagram for instruction pipeline operation. [4 Marks]
  - ii. Calculate the total processing time and throughput for the implementation of pipelining and non-pipelining.
     [Note: Please write the formula that is appropriate to use] [3 Marks]

5/5

End of Page.